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Hybrid Video Tactical Learning Model as an Integrative Framework for Physical Education

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Abstract

This study aims to develop the Hybrid-Video Tactical Learning Model (H-ViTa) as an innovative pedagogical framework that integrates video-based learning with tactical game approaches in physical education. Using a design and development approach, the study was conducted through a conceptual synthesis of previous literature on tactical learning, game-based learning, and educational technology. The proposed H-ViTa model consists of four interconnected stages: video-based cognitive preparation, tactical game experience, in-game decision-making, and post-learning reflection. This sequential framework supports students in developing tactical understanding by combining cognitive preparation with authentic game experiences and reflective learning processes. Rather than focusing solely on technical skill execution, the model emphasizes learners' ability to determine why, when, and how tactical decisions should be applied in dynamic game situations. As a conceptual pedagogical framework, H-ViTa bridges digital technology and game-based learning while providing a foundation for future empirical studies examining its effectiveness in improving students' tactical performance, learning engagement, and decision-making skills in physical education.

Introduction

Physical education plays a crucial role in developing students' competencies holistically, not only through the enhancement of motor skills but also through the development of cognitive abilities that support performance in authentic game situations. In volleyball learning, mastery of technical skills such as passing, serving, and spiking needs to be integrated with the ability to interpret game situations, engage in tactical decision-making, and solve problems that arise during gameplay. Although technical skills constitute the fundamental foundation of the game, learning approaches that focus excessively on isolated technical drills may create a gap between students' ability to execute movements and their capacity to apply these skills effectively within dynamic game contexts. Suharjana and Sumhendartin (2023) demonstrated that volleyball instruction employing a more contextual approach significantly improves students' cognitive and psychomotor learning outcomes compared with conventional instruction. Therefore, volleyball learning requires a pedagogical approach that integrates the development of technical skills with tactical understanding to enable students to make appropriate decisions across various game situations.

In response to this need, the paradigm of physical education learning has shifted from a technique-oriented approach toward game-based approaches such as Teaching Games for Understanding (TGfU) and the Tactical Games Model (TGM). These approaches position students as active problem-solvers through authentic game situations, allowing them to identify tactical problems, evaluate alternative actions, and determine the most appropriate game decisions. A meta-analysis conducted by González-Valero et al. (2024), involving 25 studies with a total of 1,692 participants, demonstrated that TGfU has a significant effect on improving decision-making abilities in sports learning, with an effect size of 0.82. Furthermore, Pan et al. (2023) found that the TGfU–Sport Education hybrid model produced greater improvements in learning motivation, enjoyment of sports participation, responsibility, and game

performance compared with the implementation of TGfU alone. Dimmick (2024) further emphasized that the integration of game-based models can create more student-centered learning experiences through the development of tactical awareness, higher-order thinking skills, and decision-making during gameplay.

In line with these pedagogical developments, advancements in educational technology have created new opportunities to strengthen physical education learning through the use of video-based learning, asynchronous learning, and hybrid learning approaches. Technology enables students to gain more flexible learning experiences by accessing visual materials before practical sessions on the field, allowing them to develop prior understanding of game patterns, strategies, and solutions to potential tactical problems. De Waelle et al. (2025) reported that a four-week video-based training program involving young volleyball players improved decision-making abilities in both video-based assessments and real-time decision-making performance during gameplay. Moreover, Fernandez Victoria et al. (2025) explained that game-based learning supported by reflection and game situation analysis can enhance students' tactical awareness, strategic thinking, and contextual understanding. Therefore, the integration of technology in physical education has the potential to optimize students' cognitive readiness and allow practical learning time to be more focused on skill application and game problem-solving.

Research on game-based tactical learning and the development of pedagogical models in physical education has continued to advance significantly. Pan et al. (2023) demonstrated that integrating Teaching Games for Understanding (TGfU) with Sport Education produces better outcomes than the standalone TGfU model, particularly in improving students' learning motivation, enjoyment of sports participation, responsibility, and game performance. Furthermore, a systematic review by Wang et al. (2024) found that the Tactical Games Model has contributed to improvements in game performance, physical activity, intrinsic motivation, and students' learning experiences, although investigations into cognitive aspects and tactical decision-making remain relatively limited. In addition, Camacho-Sánchez et al. (2023) revealed that game-based learning and gamification approaches can enhance engagement and learning outcomes in physical education. Nevertheless, these approaches still tend to focus on improving specific aspects of learning and have not yet provided a pedagogical framework that systematically connects cognitive preparation before learning, game-based movement experiences, tactical decision-making processes during activities, and reflection after learning. Therefore, there is a need to develop a learning model capable of comprehensively integrating these components as the conceptual foundation of the Hybrid-Video Tactical Learning Model (H-ViTa).

Based on this research gap, this study aims to develop the Hybrid-Video Tactical Learning Model (H-ViTa) as a pedagogical framework that integrates cognitive preparation through video-based learning, tactical game-based activities, decision-making processes during gameplay, and post-learning reflection. This model is designed to create a more holistic learning experience by not only emphasizing the improvement of game skills but also promoting tactical understanding, critical thinking abilities, and students' active engagement in the physical education learning process. Therefore, this study is

expected to provide a conceptual contribution to the development of an innovative pedagogical model that bridges the use of digital technology with game-based learning approaches in physical education.

Method

This study employed a Design and Development Research (DDR) approach by adapting the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Richey & Klein, 2014). The selection of the ADDIE model was based on the research objective to develop, conduct a limited implementation, and refine the H-ViTa (Hybrid-Video Tactical Learning Model) within the context of volleyball learning at the junior high school level. The Evaluation stage in this study was not intended to examine the effectiveness of H-ViTa through an experimental design but functioned as a formative evaluation based on the findings of the limited implementation to identify the strengths, limitations, and areas requiring product refinement. The study was conducted over a ten-month period, from September 2025 to June 2026, encompassing all stages of H-ViTa development, from needs analysis to final product revision.

The Analysis stage was conducted from September to October 2025 to identify learning needs and various challenges in volleyball tactical learning at the junior high school level. The study was conducted in two public junior high schools in Metro City, Lampung Province, Indonesia, which were purposively selected based on the implementation of the Merdeka Curriculum and the availability of volleyball learning facilities. Participants in this stage involved four Physical Education, Sports, and Health (PESH) teachers with teaching experience ranging from five to eighteen years and 64 ninth-grade students aged 14–15 years from two classes who had previously received basic volleyball instruction. One of the teachers involved in this stage was Sidik, who had 18 years of teaching experience and later served as a collaborating teacher during the Development, Implementation, and Evaluation stages of H-ViTa. Data were collected through an analysis of Merdeka Curriculum documents, observations of four volleyball learning sessions, semi-structured interviews with PESH teachers, and an initial assessment of students' manipulative movement skills. The observation instrument covered the instructional approaches employed by teachers, the proportion of technical and tactical activities, teacher–student interactions, and the use of instructional media. The interviews were conducted to explore challenges in tactical learning, limitations in time and facilities, and opportunities for integrating technology into learning. Meanwhile, the assessment of manipulative movement skills was conducted using an observation rubric evaluating students' ball control, positional movement, ball trajectory anticipation, and movement coordination.

Data obtained during the Analysis stage were analyzed using thematic analysis through the processes of data reduction, coding, category classification, and identification of major themes (Terry et al., 2017). The credibility of the findings was strengthened through source triangulation derived from curriculum documents, classroom observations, teacher interviews, and students' manipulative movement skill assessments. The findings from this stage served as the foundation for designing H-ViTa requirements, including the use of asynchronous tactical videos as a cognitive scaffolding medium, tactical debriefing

to deepen tactical understanding, manipulative warm-up as a bridge between motor readiness and tactical understanding, tactical mini-games and full game application as spaces for applying game decisions, and reflective closure as a medium for learning reflection.

The Design stage was conducted from November to December 2025 by synthesizing the results of the needs analysis with several theoretical foundations, namely Teaching Games for Understanding (TGfU), the Tactical Games Model (TGM), Cognitive Theory of Multimedia Learning (CTML), embodied learning, and motor learning. This process resulted in the initial design of H-ViTa, consisting of six learning phases: asynchronous tactical video, tactical debriefing, manipulative warm-up, tactical mini-game, full game application, and reflective closure. These six phases were designed to create an integration between cognitive understanding, motor readiness, game experiences, and tactical decision-making abilities in accordance with the characteristics of PESH learning at the junior high school level.

The Development stage was conducted from January to February 2026 by translating the conceptual design of H-ViTa into initial learning products, including eight episodes of asynchronous tactical videos, a hybrid learning module, eight hybrid lesson plans, twelve tactical mini-game cards, and an assessment and reflection guide. The initial products then underwent an expert review process in March 2026 involving three purposively selected experts: Ikhsan as a volleyball tactics expert, Yudha as an educational technology expert, and Sidik as a PESH teacher and collaborating teacher. The review process employed an evaluation sheet using a four-point Likert scale complemented by open-ended comment sections to obtain qualitative feedback. The evaluated aspects included the validity of tactical content, the quality of media design, the clarity of the six-phase H-ViTa structure, the feasibility of model implementation in school settings, and the suitability of the products with junior high school students' characteristics. The feedback provided by the experts was used as the basis for revising the initial products, including simplifying tactical terminology, improving the visual design and duration of the videos, developing more contextual examples of game situations, and adding teacher guidance within the tactical debriefing phase.

The Implementation stage was conducted from April to May 2026 through a limited trial of the revised H-ViTa product following the expert review. The trial involved 32 eighth-grade students who were purposively selected based on the suitability of volleyball content within the PESH curriculum and the class readiness to participate in hybrid learning. The implementation was conducted by Sidik as the collaborating teacher across eight learning sessions. Implementation data were collected through observations of model implementation using an observation sheet that covered students' engagement in each H-ViTa phase, the achievement of learning activities, teacher–student interactions, and challenges encountered during implementation. In addition, interviews were conducted with Sidik to obtain the teacher's perspective regarding the practicality of the model, as well as with three students purposively selected based on variations in their experiences during implementation: Angel, representing a positive acceptance experience; Edo, representing the process of developing tactical understanding; and Nanda, representing challenges in using asynchronous tactical videos.

The Evaluation stage was conducted from May to June 2026 as a formative evaluation based on data obtained during the Implementation stage. The evaluation process involved analyzing the results of observations, teacher interviews, and student interviews to identify aspects of the product that still required refinement. The evaluation focused on the consistency of students' access to asynchronous tactical videos, the depth of tactical reflection, teachers' needs for strategies to facilitate tactical debriefing, the effectiveness of manipulative warm-up activities, and the flexibility of implementing tactical mini-games under different classroom conditions. The evaluation findings were used to produce the final refinement of H-ViTa, including improving the accessibility of asynchronous tactical videos, strengthening teacher guidance in facilitating tactical debriefing, refining manipulative warm-up activities, adjusting tactical mini-game activities according to learning conditions, and enhancing students' reflection strategies within the assessment guide.

Results

Needs Analysis Findings as the Foundation for H-ViTa Development

The needs analysis was conducted through an examination of Merdeka Curriculum documents, observations of volleyball learning sessions, interviews with four Physical Education, Sports, and Health (PESH) teachers, namely Yanto, Sidik, Ula, and Edi, as well as an initial assessment of the manipulative movement skills of 64 ninth-grade students. The results of the document analysis indicated that the PESH learning outcomes in volleyball materials not only emphasize the mastery of technical skills but also the development of students' abilities to understand game situations, make decisions appropriate to game conditions, and build cooperation among players.

Table 1
Results of PESH Curriculum Analysis on Volleyball Materials

Curriculum Aspect	Findings
Learning objectives	Students are expected to master technical skills, understand game situations, make decisions, and collaborate during game activities.
Learning characteristics	Learning emphasizes game experiences, active student participation, and the ability to solve problems that emerge during gameplay.

However, observations conducted across four volleyball learning sessions in two public junior high schools in Metro City revealed a gap between curriculum expectations and classroom practice. On average, 57 out of 80 minutes of instructional time were allocated to basic technical drills such as passing, serving, and setting, while game activities involving tactical application lasted only approximately 12 minutes. Learning was also predominantly characterized by teacher demonstrations and repetitive technical exercises, whereas activities specifically designed to develop students'

understanding of game situations and tactical decision-making had not been systematically implemented.

Table 2
Results of Volleyball Learning Observations

Observation Aspect	Findings
Allocation of learning activities	On average, 57 of 80 instructional minutes were devoted to basic technical drills, approximately 12 minutes were allocated to game activities, and the remaining time was used for opening and closing activities.
Learning approach	Learning remained centered on teacher demonstrations and repeated practice of basic techniques.
Tactical learning	Teachers provided simple instructions, such as maintaining positions and finding open spaces, but no specific activities were designed to train game situation analysis and decision-making.
Use of instructional media	No use of videos or digital media was identified to support tactical learning.
Learning reflection	Evaluation focused more on technical accuracy, while reflection on tactical decisions had not yet been conducted systematically.

The observational findings were reinforced through interviews with the four PESH teachers. Yanto explained that most students were able to follow basic technical training but experienced difficulties when applying these skills in actual game situations. According to Yanto, “Students can usually perform passing or serving according to the given examples, but when the game begins, they often become confused about determining their positions and deciding what actions should be taken.”

Sidik added that limited instructional time was one of the factors causing teachers to prioritize technical training over tactical learning. According to Sidik, “The available instructional time is often insufficient to teach technical skills while simultaneously guiding students to understand game strategies in depth.”

Ula also stated that the relatively large number of students in a single class made the management of tactical activities more challenging. Ula explained, “There are many students on one court, so we often focus more on practicing basic techniques to ensure that all students have opportunities to participate in practical activities.”

Meanwhile, Edi explained that the use of simple technologies such as WhatsApp presents opportunities to support tactical learning. According to Edi, “Using videos through WhatsApp is more feasible because students are already accustomed to accessing learning information through the application before classroom activities take place.”

Table 3
Summary of PESH Teachers' Interview Findings

Informant	Main Findings
Yanto	Students are capable of performing basic techniques but experience difficulties in determining positions and making decisions during gameplay.
Sidik	Limited instructional time causes teachers to prioritize technical practice rather than in-depth tactical learning.
Ula	The large number of students leads learning activities to focus more on technical exercises that are easier to manage.
Edi	The use of videos through WhatsApp is considered a realistic alternative for providing tactical understanding before practical sessions.

In addition to tactical understanding, this study also identified students' manipulative movement skills as a basis for model development. The assessment of 64 ninth-grade students was conducted using a rubric that categorized students' abilities into good, moderate, and low levels. The results showed that the majority of students fell into the moderate category across almost all aspects of movement ability. These findings indicate that students already possessed fundamental volleyball playing skills; however, they still required learning activities that could help them integrate movement abilities with the demands of dynamic game situations, particularly in terms of positional movement, ball trajectory anticipation, and decision-making.

Table 4
Initial Assessment Results of Students' Manipulative Movement Skills (n = 64)

Ability Aspect	Good	Moderate	Low
Passing direction control	22 students (34%)	31 students (48%)	11 students (18%)
Positional movement according to ball direction	18 students (28%)	34 students (53%)	12 students (19%)
Ball trajectory anticipation	16 students (25%)	35 students (55%)	13 students (20%)
Movement coordination during gameplay	24 students (37%)	29 students (45%)	11 students (18%)

Based on the synthesis of the needs analysis findings, several key requirements were identified as the foundation for H-ViTa development. First, there is a need for learning that integrates technical skill mastery with tactical understanding, enabling students to recognize when and how skills should be applied within game contexts. Second, transitional activities are required to connect motor readiness with the application of tactical decisions; therefore, the manipulative warm-up phase was developed as one of the key characteristics of H-ViTa. Third, a more flexible learning design is required by utilizing

accessible technology and providing students with opportunities to gain more meaningful game experiences.

Table 5
Synthesis of Needs Analysis Findings and Their Implications for H-ViTa Development

Needs Analysis Findings	Learning Requirements	H-ViTa Components
Learning is still dominated by technical drills with minimal decision-making activities	Structured tactical learning based on game situations	Asynchronous Tactical Video and Tactical Debriefing
Students experience limitations in integrating movement, positional changes, and anticipating game situations	Activities that connect motor readiness with tactical understanding	Manipulative Warm-Up
Limited instructional time and accessibility of technologies such as WhatsApp	A flexible learning model that can be conducted before practical field sessions	Hybrid Video-Based Learning
Lack of game experiences that require strategic thinking and reflection	Progressive game activities and evaluation of game experiences	Tactical Mini-Game, Full Game Application, and Reflective Closure

These findings indicate that the development of H-ViTa was not merely based on conceptual considerations but also represented a response to actual needs identified within the context of volleyball learning at the junior high school level. The entire needs analysis findings served as the foundation for designing the six phases of H-ViTa, integrating video-based tactical learning, manipulative movement readiness, game-based playing experiences, and reflective activities as efforts to improve students' tactical understanding and decision-making.

Development of the H-ViTa Model Structure Based on Needs Analysis Findings

Based on the results of the needs analysis, three primary needs were identified as the foundation for the development of H-ViTa: the necessity for more structured tactical learning, activities that connect tactical understanding with students' motor readiness, and a flexible learning design through the utilization of accessible technology. These three needs were subsequently synthesized with various theoretical approaches to develop a learning model that aligns with the characteristics of volleyball learning at the junior high school level.

The development of H-ViTa integrates several learning theories that contribute to the formation of the model structure. The Teaching Games for Understanding (TGfU) approach and the Tactical Games Model (TGM) were adopted because they position games as a means of developing tactical understanding, problem-solving abilities, and students' decision-making skills. The Cognitive Theory of Multimedia Learning (CTML) served as the foundation for using videos as instructional media that assist

students in developing initial understandings of game situations before engaging in direct practice. Furthermore, embodied learning theory emphasizes the importance of bodily engagement and movement experiences in the process of concept understanding, whereas motor learning theory provides the foundation for designing progressive movement activities that correspond to game demands. The integration between theoretical principles and their implementation within H-ViTa is presented in Table 6.

Table 6
Integration of Theoretical Foundations and the Development of H-ViTa Phases

Theoretical Foundation	Main Principle	Implementation in H-ViTa
Teaching Games for Understanding (TGfU)	Game-based learning oriented toward situational understanding, problem-solving, and decision-making	Tactical debriefing, tactical mini-game, and full game application
Tactical Games Model (TGM)	The use of modified game situations to train tactical decision-making	Tactical mini-game and full game application
Cognitive Theory of Multimedia Learning (CTML)	Integration of visual and verbal information to construct mental representations	Asynchronous tactical video
Embodied Learning	Understanding is strengthened through bodily involvement and movement experiences	Manipulative warm-up
Motor Learning	Movement skills develop through progressive practice adapted to game contexts	Manipulative warm-up and progressive game activities

Based on the integration of needs analysis findings and these theoretical foundations, the H-ViTa structure was developed consisting of six interconnected learning phases. The asynchronous tactical video phase functions to provide initial knowledge regarding game patterns, strategies, and tactical situations before practical activities take place. This phase is followed by tactical debriefing, which provides opportunities for teachers and students to clarify concepts, engage in discussions, and connect tactical concepts with upcoming game activities.

Furthermore, the manipulative warm-up phase was developed as a key characteristic and distinguishing feature of H-ViTa compared with previous tactical learning models. This phase not only aims to prepare students' physical conditions but also integrates motor readiness with tactical understanding through movement activities that represent the demands of game situations. Subsequently, students enter the tactical mini-game phase, which presents simple and modified game situations to train their ability to identify problems and determine appropriate decisions. These abilities are then applied in the full game application phase through more complex gameplay that closely resembles actual match conditions. In the final stage, the reflective closure phase is used to help students evaluate decisions, strategies, and learning experiences gained throughout the gameplay process.

Table 7
Structure and Learning Focus of Each Phase in the H-ViTa Model

H-ViTa Phase	Learning Focus
Asynchronous Tactical Video	Activation of prior knowledge through video-based tactical learning before practical sessions
Tactical Debriefing	Clarification of concepts and discussion of tactical implementation in gameplay
Manipulative Warm-Up	Integration of motor readiness with tactical understanding through contextualized activities
Tactical Mini-Game	Decision-making practice through modified game situations
Full Game Application	Application of technical skills and tactical decisions in more complex game situations
Reflective Closure	Evaluation and reflection on strategies and gameplay experiences

The six-phase structure of H-ViTa demonstrates that the developed model does not merely focus on improving technical abilities but also establishes continuous connections among tactical understanding, motor readiness, game experiences, and learning reflection. The main uniqueness of H-ViTa lies in the integration of video-based tactical learning with the manipulative warm-up phase, which serves as a bridge between cognitive processes and motor readiness before students engage in gameplay activities. Therefore, the H-ViTa structure provides a more comprehensive learning approach to address the gap between technical skill mastery and decision-making abilities identified during the needs analysis stage. The model design was subsequently developed into various learning products, including tactical videos, a hybrid learning module, lesson plans, and tactical mini-game scenarios, which later underwent an expert review process to further refine the model.

Development of Learning Materials and Final Refinement of the H-ViTa Product

Based on the six-phase H-ViTa structure developed in the previous stage, the development process was conducted by translating the conceptual model design into learning products applicable within the context of volleyball learning at the junior high school level. The initial products were developed by considering the relationship between each learning component and the characteristics of each H-ViTa phase. This stage produced several initial learning products, including asynchronous tactical videos, a hybrid learning module, lesson plans, tactical mini-game cards, and an assessment guide. The development of eight videos and eight lesson plans was aligned with a single junior high school volleyball learning unit, allowing each session to have a specific learning focus and progressively developed tactical problems.

Table 8
Initial H-ViTa Products Developed

Product	Main Function
Asynchronous Tactical Video	Provides an initial learning experience through the introduction of tactical problems before practical sessions on the court
Hybrid Learning Module	Provides guidance for teachers and students in implementing all phases of H-ViTa
Lesson Plans	Organizes the implementation of the six H-ViTa phases in each learning session
Tactical Mini-Game Cards	Provides modified game activities to train game situation analysis and tactical decision-making
Assessment Guide	Assists teachers in evaluating tactical understanding, decision-making, game engagement, and students' reflection

The initial H-ViTa products subsequently underwent an expert review process involving Ikhsan as a volleyball tactics expert, Yudha as an educational technology expert, and Sidik as an experienced PESH teacher. Each expert reviewed the products according to their respective areas of expertise through evaluation sheets and provided feedback through written comments and direct discussions. The review focused on three main aspects: the validity of tactical content, the quality of instructional media design, and the feasibility of implementing the model within actual school learning contexts.

The review findings indicated that, overall, the structure and learning materials of H-ViTa were aligned with the needs of junior high school volleyball learning. However, several aspects still required refinement to improve product quality. Ikhsan noted that tactical terms such as *transition* and *cover* needed to be presented through simpler and more contextual game situations to facilitate students' understanding. Yudha emphasized the need for more effective video duration, additional visual cues, and a simplified visual presentation to ensure that students' attention remained focused on tactical problems. Meanwhile, Sidik suggested adding guiding questions during the tactical debriefing phase and providing variations in game activities to make the model more adaptable to classes with different numbers of students.

Table 9
Expert Review Findings and Revisions of H-ViTa Products

Expert	Review Focus	Feedback	Product Revision
Ikhsan	Validity of tactical content and suitability of materials with junior high school students' characteristics	Tactical terminology remained too abstract and required more contextual examples	Simplification of tactical terminology and addition of game situation examples in videos and modules
Yudha	Visual quality and effectiveness of digital media	Videos needed to be shorter, more focused, and supported by clear visual cues	Video duration was adjusted to 3–5 minutes, player position markers were added, and visual displays were simplified
Sidik	Feasibility of model implementation in school learning	Teachers required discussion guidance and variations in activities according to classroom conditions	Addition of guiding questions during tactical debriefing and alternative tactical mini-game scenarios

Following the revision process based on expert feedback, the final H-ViTa product was refined in terms of tactical content, media design, and learning implementation strategies. The final product consists of eight episodes of asynchronous tactical videos with durations of 3–5 minutes, a hybrid learning module, eight lesson plans, twelve tactical mini-game cards, and an assessment guide integrated with the six phases of H-ViTa.

As the primary product within the asynchronous tactical video phase, each video was designed using a tactical problem-solving approach by presenting authentic game situations, tactical problems, alternative decisions, and reflective questions as discussion materials during the tactical debriefing phase. The final structure of the video content following expert revisions is presented in Table 10.

Table 10
Final Structure of H-ViTa Asynchronous Tactical Video Content After Expert Revision

Episode	Game Situation	Tactical Problem	Alternative Decision	Reflective Question
Video 1	Players gather in one area of the court, causing an imbalance in playing space	How can positions and playing space be organized effectively?	Maintaining distance between players, changing positions, and utilizing open spaces	“What happens if all players only follow the direction of the ball?”
Video 2	Players respond too late to the opponent’s ball	How can players anticipate the direction and speed of the incoming ball?	Observing opponents’ movements, taking the initial step, and adjusting body position	“When should players start moving before the ball arrives?”
Video 3	The first pass fails to build an attacking pattern	How can passing decisions support the team's attack?	Selecting appropriate passing techniques and directing the ball toward advantageous positions	“Why do passing decisions influence attacking opportunities?”
Video 4	Attacks are easily predicted by opponents	How can more effective attacking opportunities be created?	Directing the ball into open spaces and adjusting attacking choices based on opponents’ positions	“Which area is the most difficult for opponents to reach and why?”
Video 5	Errors occur due to poor coordination among players	How can communication and responsibility be developed during gameplay?	Using verbal communication, understanding roles, and maintaining team coordination	“How can communication improve the quality of team decisions?”
Video 6	Previous strategies are ineffective in responding to changing situations	How can decisions be adjusted based on dynamic game conditions?	Changing positions, strategies, or game patterns according to match developments	“Why can the right decision change depending on the situation?”
Video 7	The game is played with variations in the number of players and modified rules	How can strategies be adjusted to different game conditions?	Adjusting positions, role distribution, and team communication patterns	“What strategies need to change when the game rules change?”
Video 8	Students observe a complete sequence of gameplay from the serve until the end of a rally	How can various tactical decisions be integrated comprehensively during gameplay?	Integrating game reading, positional decisions, communication, and appropriate strategy selection	“Which decision most determines a team’s success in a single rally?”

The final H-ViTa product demonstrates the integration of video-based tactical learning, manipulative movement experiences, problem-solving-oriented game activities, and reflective activities after gameplay. The results of this development produced a hybrid volleyball learning model that not only emphasizes the mastery of technical skills but also develops students' ability to understand game situations, make decisions, and apply strategies contextually according to the characteristics of junior high school learning.

Implementation and Final Refinement of the H-ViTa Model

Following the development and refinement stages based on expert review, H-ViTa was implemented on a limited basis to evaluate the feasibility and practicality of the model within authentic learning settings. The implementation involved 32 eighth-grade junior high school students across eight learning sessions, which corresponded to the eight episodes of asynchronous tactical videos and eight developed lesson plans. The learning process was facilitated by Sidik as a Physical Education, Sports, and Health (PESH) teacher as well as a collaborating teacher involved in the H-ViTa development process. This implementation stage was not intended to examine the effectiveness of the model in improving learning outcomes but rather to identify user experiences, implementation challenges, and product aspects that still required refinement before producing the final version of H-ViTa.

Table 11
Observation Results of the Implementation of Each H-ViTa Phase During the Limited Implementation

H-ViTa Phase	Implementation Findings
Asynchronous Tactical Video	During the first two learning sessions, 26 out of 32 students accessed the videos before the lessons. After the teacher provided reminders through the WhatsApp group and offered easier access, the number of students accessing the videos increased to 30–31 students in the subsequent sessions.
Tactical Debriefing	Most students were able to identify the tactical problems presented in the videos. However, at the beginning of the implementation, students' responses were still descriptive, requiring the teacher to use guiding questions to help students explain the reasoning behind their game decisions.
Manipulative Warm-Up	Students demonstrated high engagement because the warm-up activities were connected to game situations. However, some students still required additional demonstrations to understand the relationship between the movement activities and the intended tactical objectives.
Tactical Mini-Game	The modified game activities were implemented actively. Students began to explore various strategic alternatives, such as adjusting their positions, improving communication with teammates, and considering open spaces before making game decisions.
Full Game Application	In the final session, teacher observations showed that students communicated verbally with teammates more frequently, maintained better positional balance within the playing area, and began to consider opponents' open spaces when determining attacking directions compared with the initial sessions.
Reflective Closure	At the beginning of the implementation, only 18 students were able to clearly explain their tactical reasoning during reflective activities. After the teacher applied more structured questions, this number increased to 27 students in the final session.

The interview findings with Sidik indicated that H-ViTa provided a different learning experience compared with previous volleyball learning practices. According to Sidik, "The use of videos before learning makes practical sessions on the court more effective because students already have an initial understanding of the tactical problems to be studied. Learning is no longer focused solely on technical practice but also encourages students to understand the reasons behind every decision made during the game."

Interview findings from three students selected to represent different user experiences demonstrated that H-ViTa received positive responses from students. Angel explained that before using H-ViTa, she tended to simply follow the direction of the ball without considering positioning and game strategies. According to Angel, "Previously, I only chased the ball, but after watching the videos and engaging in discussions, I began to understand when to change my position and how to cooperate with my teammates."

Edo also stated that the videos helped students recognize mistakes that frequently occurred during gameplay. According to Edo, "The videos made me realize the mistakes I made during the game, such as hitting the ball immediately without considering my teammates' positions or the opponents' open spaces, resulting in less appropriate decisions."

However, several challenges were still identified during the implementation. Nanda revealed that she occasionally forgot to access the videos before the lessons, which caused difficulties in participating in the initial discussion sessions. According to Nanda, “Sometimes I forgot to watch the videos before class, so during discussions I did not fully understand the game situations being discussed.”

These findings indicate that H-ViTa can be implemented effectively and was positively accepted by both teachers and students. Nevertheless, the implementation also revealed the need for further refinement regarding video accessibility, the depth of tactical reflection, the flexibility of game activities, and teacher guidance in managing the learning process.

Table 12
Final H-ViTa Product Revisions Based on Limited Implementation Findings

Product Component	Implementation Findings	Final Product Refinements
Asynchronous Tactical Video	Some students did not consistently access the videos and still experienced difficulties identifying the main information presented in the videos.	The videos were enhanced with a learning checklist, a summary of key concepts at the end of each video, and reduced file sizes to improve accessibility through students’ devices.
Tactical Debriefing Guide	Students’ responses remained descriptive and they had not yet been able to explain the reasoning behind tactical decisions in depth.	The teacher guide was enriched with structured tactical questioning to assist students in identifying game problems, evaluating alternative decisions, and explaining the rationale for their strategic choices.
Manipulative Warm-Up Activities	Some movement activities required additional demonstrations to make the relationship between movement execution and tactical objectives easier to understand.	The module was supplemented with movement illustrations, progressive activity stages from simple to complex levels, and examples of feedback that teachers could provide during instruction.
Tactical Mini-Game Cards	Game implementation needed to be adjusted according to the number of students and school facility conditions.	Each mini-game was provided with alternative game formats (3 vs. 3, 4 vs. 4, and 6 vs. 6), variations in playing area size, and modifications to game rules.
Assessment and Reflection Guide	Students experienced difficulties in conducting in-depth reflections on the decisions they made during gameplay.	A tactical reflection worksheet was added to assist students in identifying game situations, decisions made, the reasons for selecting those decisions, and alternative strategies that could be applied.

Based on the results of the limited implementation and the final revision process, H-ViTa underwent refinement in terms of learning content, media design, teacher guidance, flexibility of game activities, and students’ reflection strategies. The final H-ViTa product consists of eight episodes of asynchronous tactical videos equipped with learning checklists and summaries of key concepts, a hybrid learning module containing structured tactical questioning guidance and movement activity illustrations, eight

lesson plans, twelve tactical mini-game cards with various game format variations, and an assessment guide complemented by a tactical reflection worksheet. These development results indicate that H-ViTa not only possesses a strong theoretical foundation and content validity through expert review but also demonstrates a high level of practicality based on limited implementation experiences. Therefore, the H-ViTa model has reached an adequate level of readiness for future studies focusing on examining its effectiveness in improving students' tactical understanding and decision-making abilities in volleyball games.

Discussion

The findings of this study indicate that the dominance of technique-oriented volleyball learning remains a barrier to developing students' tactical thinking and decision-making abilities during gameplay. This condition was reflected in the needs analysis findings, which showed that learning primarily focused on isolated practice of passing, serving, and spiking, while students had limited opportunities to encounter authentic game situations, analyze game-related problems, and determine tactical decisions. These findings are consistent with previous studies indicating that technique-based approaches tend to limit students' engagement in solving game-related problems. A meta-analysis by Abad Robles et al. (2020) found that tactical-based approaches resulted in greater improvements in decision-making abilities compared with technique-based approaches (effect size = 0.89), whereas Breed et al. (2025) emphasized that game-based learning models are consistently more effective in enhancing students' game understanding and procedural knowledge. Therefore, the results of this study highlight the need for a paradigm shift in volleyball learning from an approach that positions technical mastery as the primary objective toward an approach that considers technical skills as a means of solving tactical problems within authentic game contexts.

The development of H-ViTa was based on the principle that tactical learning should integrate cognitive understanding, game experiences, and movement activities continuously. This perspective aligns with the principles of Teaching Games for Understanding (TGfU) and the Tactical Games Model (TGM), which position gameplay as the primary context for developing tactical awareness and decision-making abilities. Studies by Barba-Martín et al. (2020) and Wang et al. (2024) demonstrated that tactical-based learning approaches are effective in developing game understanding, while the meta-analysis by González-Valero et al. (2024) reported that TGfU had a positive effect on students' decision-making abilities with a Hedges' g value of 0.82. However, most implementations of TGfU and TGM still focus on face-to-face interactions during the learning process, whereas the integration of tactical learning with asynchronous technology as a cognitive preparation stage before gameplay activities remains relatively underexplored. In this context, H-ViTa extends the concept of tactical learning through the addition of the asynchronous tactical video phase, which enables students to develop an initial understanding of game situations before entering practical activities. This approach is consistent with the findings of Shen and Shao (2022), who demonstrated that hybrid pedagogical models in physical education can produce more comprehensive improvements in game performance, decision-making, motivation, and social skills.

The asynchronous tactical video component represents one of the major innovations of H-ViTa because it functions as a cognitive preparation stage before students engage in gameplay activities. The increase in the number of students accessing the videos from 26 students during the initial implementation to 30–31 students in subsequent sessions indicates a high level of acceptance of asynchronous learning media and demonstrates its potential to extend learning experiences beyond the limitations of instructional time in physical education classes. This finding is supported by the meta-analysis of Noetel et al. (2021), which demonstrated that the use of videos as supplementary learning materials has a significant positive effect on students' learning outcomes. The development of H-ViTa videos also follows the principles of the Cognitive Theory of Multimedia Learning (CTML), which emphasizes the importance of managing visual and verbal information according to students' cognitive processing capacities (Mayer, 2024; Ramadan et al., 2025). Therefore, expert feedback regarding the simplification of visual sequences and information presentation during the development process can be understood as an effort to reduce extraneous cognitive load, as explained by Castro-Alonso et al. (2024). Thus, asynchronous tactical videos in H-ViTa do not merely serve as supporting media but function as a form of cognitive scaffolding that assists students in building conceptual readiness before engaging in more complex tactical activities.

The expert review process demonstrated that the development of a learning model requires not only alignment between theory and content but also consideration of students' cognitive characteristics and the context of implementation in schools. Expert feedback regarding the simplification of tactical terminology, improvement of video visuals, and enhancement of teacher guidance indicates that the quality of a learning model is determined by the balance between content validity, instructional design, and practical feasibility in real educational settings. These findings align with the principles of Design and Development Research (DDR), which emphasize formative evaluation and iterative revisions as essential stages for producing relevant and applicable products in authentic contexts. Li and Cheong (2023) showed that the ADDIE approach enables the systematic development of learning products through needs analysis, expert validation, implementation, and continuous improvement. Furthermore, studies by Fizi et al. (2023) and Nurfauzan et al. (2025) emphasized that the involvement of experts from various fields is necessary to ensure product quality in terms of content, media, and instructional practice. Therefore, the revision of H-ViTa based on the perspectives of volleyball tactics experts, educational technology experts, and PESH teachers not only improved the technical quality of the product but also strengthened its suitability for the needs and abilities of junior high school students.

The tactical debriefing phase becomes a crucial component of H-ViTa because it provides opportunities for students to transform gameplay experiences into more conscious tactical understanding. During the initial implementation, students tended to describe game situations descriptively without being able to explain the reasoning behind their decisions. However, the increase in the number of students who were able to provide clear tactical reasoning from 18 to 27 students indicates that reflection facilitated through structured tactical questioning can promote the development of tactical thinking skills. These findings support the perspective of the Tactical Decision Learning Model (T-DLM) developed by Godbout and Gréhaigne (2022), in which discussion and reflective questioning function as mechanisms that help

students organize gameplay experiences into explicit tactical knowledge. These findings are also consistent with the study by Tokay et al. (2025), which showed that tactical game-based volleyball learning is more effective in improving metacognitive awareness compared with technique-based learning. Therefore, the inclusion of structured tactical questioning in the final H-ViTa product represents an important step in ensuring that gameplay activities produce not only physical experiences but also processes of reflection and tactical knowledge construction.

The manipulative warm-up phase demonstrates that physical preparation activities can serve broader functions beyond merely improving bodily readiness before exercise. Implementation findings showed that students were more engaged when warm-up activities were connected to game contexts and specific tactical objectives. These findings support the perspective of embodied learning, which emphasizes that thinking processes develop through interactions among the body, actions, and the environment. Faella et al. (2025) demonstrated that physical education activities integrating movement challenges with learning contexts can simultaneously improve student engagement, bodily awareness, and cognitive involvement. Therefore, the manipulative warm-up in H-ViTa represents an important innovation because it transforms a traditionally routine warm-up activity into a transitional stage that connects cognitive preparation from asynchronous tactical videos with the application of tactical decisions in gameplay situations.

The tactical mini-game and full game application phases become the primary spaces for students to test and apply the tactical understanding developed during previous phases. Improvements in communication among players, the ability to maintain positional balance, and awareness of utilizing opponents' open spaces indicate that modified game activities can create learning environments that are more closely aligned with the demands of actual gameplay. These findings are consistent with the study of Fernández-Espínola et al. (2020), which explained that small-sided games provide learning experiences that simultaneously integrate physical, technical, and tactical aspects. In the context of volleyball, Rodrigues et al. (2022) showed that modifications to court size and the number of players can influence the quality of decision-making and movement effectiveness among novice players. Similar findings were reported by Machado et al. (2024) and Sgrò et al. (2022), demonstrating that tactical game-based learning can improve students' decision-making abilities and game performance. Therefore, the gradual transition from tactical mini-games to full game application in H-ViTa reinforces the principles of TGfU and TGM, suggesting that tactical understanding develops through students' active engagement in increasingly complex game situations.

The reflective closure phase completes the H-ViTa learning cycle by providing students with opportunities to evaluate their gameplay experiences and transform them into more structured tactical understanding. The improvement in students' ability to explain the reasoning behind their game decisions indicates that gameplay experiences do not automatically lead to tactical understanding but require a guided reflective process. These findings support the perspective of the Tactical Decision Learning Model (T-DLM) developed by Godbout and Gréhaigne (2022), which emphasizes that observation, discussion, and reflection are essential mechanisms in helping students construct tactical

knowledge from gameplay experiences. Moreover, Khodaei et al. (2022) demonstrated that the integration of asynchronous learning with reflective activities can improve students' readiness for self-directed learning and metacognitive awareness. Therefore, the development of the tactical reflection worksheet in the final H-ViTa product functions as a form of scaffolding that assists junior high school students in evaluating the rationale and quality of their tactical decisions during gameplay.

Overall, the limited implementation findings indicate that H-ViTa has the potential to address various problems identified during the needs analysis stage, including the dominance of technique-based learning, limited use of instructional media, restricted practice time, and the lack of opportunities for students to connect technical skills with game contexts. The increased student access to asynchronous tactical videos, higher engagement in manipulative warm-up activities, improvements in the quality of tactical reflection, and changes in gameplay behaviors such as communication and spatial utilization demonstrate that the integration of the six H-ViTa phases can create more contextual learning experiences. These findings are consistent with Noetel et al. (2021), who showed that the use of videos as supplementary learning materials can improve learning outcomes, and with Camacho-Sánchez et al. (2023), who emphasized that pedagogically designed game-based learning environments can enhance student engagement and learning experiences. Therefore, H-ViTa does not merely introduce technology into PESH learning but integrates technology, movement activities, gameplay experiences, and reflection into an interconnected tactical learning cycle.

From a theoretical perspective, the main contribution of H-ViTa lies in the integration of the Teaching Games for Understanding (TGfU), Tactical Games Model (TGM), Cognitive Theory of Multimedia Learning (CTML), embodied learning, and Design and Development Research (DDR) frameworks into a systematic learning model. Previous studies have generally explored tactical approaches, hybrid learning, or digital media use separately. However, H-ViTa extends these approaches by presenting a learning sequence that begins with asynchronous tactical videos as a cognitive preparation stage, followed by tactical debriefing, manipulative warm-up, tactical mini-games, full game application, and reflective closure as stages for evaluating and reinforcing tactical understanding. This contribution responds to the gaps identified by Wang et al. (2024) regarding the need to develop cognitive and technological dimensions within tactical learning models, as well as by Shen and Shao (2022) regarding the need to develop hybrid pedagogical models with clearer mechanisms for learning integration. From a practical perspective, H-ViTa provides an alternative for PESH teachers to overcome limitations in instructional time and variations in students' abilities through structured resources, including tactical videos, hybrid learning modules, tactical mini-game cards, tactical questioning guides, and reflection instruments.

Nevertheless, this study remains at the formative evaluation and limited implementation stages; therefore, the findings cannot yet be used to conclude the effectiveness of H-ViTa in improving tactical awareness, decision-making, and game performance through standardized assessment instruments such as the Game Performance Assessment Instrument (GPAI) or TacticUP®. The findings obtained from eight implementation sessions primarily represent initial evidence regarding the acceptability,

practicality, and potential application of H-ViTa in authentic learning contexts. Therefore, future studies should examine its effectiveness through quasi-experimental or experimental designs involving larger participant groups, more diverse school contexts, and validated game assessment instruments. In addition, longitudinal studies and mixed-methods approaches are required to understand the sustainability of H-ViTa's impact as well as the cognitive, social, and motor mechanisms that support the development of students' tactical abilities.

Conclusion

This study successfully developed the Hybrid-Video Tactical Learning Model (H-ViTa) as a pedagogical model that integrates video-based learning with a tactical game-based approach in physical education. The model demonstrates that effective tactical learning does not solely depend on students' engagement in gameplay activities but also requires cognitive preparation before learning, decision-making processes during gameplay, and reflective activities after learning experiences. The integration of these four components enables students to gain more meaningful learning experiences because they not only understand how to perform a skill but also why and when the skill should be applied in dynamic game situations. Therefore, H-ViTa offers a more comprehensive learning approach by continuously connecting the use of digital technology, tactical understanding, and students' movement experiences.

From a theoretical perspective, this study contributes to the development of a new pedagogical framework that extends the game-based learning approach by incorporating the role of video-based learning as a stage of cognitive preparation and tactical reflection. From a practical perspective, this model may serve as an alternative for physical education teachers in designing more interactive, contextual, and student-centered learning experiences. Nevertheless, this study remains limited to the conceptual development of the model; therefore, the effectiveness of H-ViTa implementation in improving students' decision-making abilities, game performance, and learning outcomes has not yet been empirically examined. Consequently, future studies are recommended to implement and experimentally evaluate this model across various educational levels and different game contexts to examine its validity and long-term impact on physical education learning.

Declarations

Ethical Approval

This study was approved by the Research Ethics Commission of Universitas Terbuka, Indonesia (Ethical Approval No. 087/UN31.LPPM/EC/2025). The ethical review process was coordinated through the Research and Community Service Institute (LPPM). All research procedures involving human participants were conducted in accordance with the institutional ethical standards and the principles of the Declaration of Helsinki and its later amendments.

Consent to Participate

Written informed consent was obtained from all participants and from their parents or legal guardians prior to participation in this study, as all participants were under 16 years of age. Participants and their parents or legal guardians were fully informed about the purpose of the study, the study procedures, potential benefits and risks, and their rights, including voluntary participation and the right to withdraw from the study at any time without any consequences. The anonymity and confidentiality of all participants were strictly maintained throughout the research process.

Consent to Publish

Written informed consent for publication was obtained from all participants and from their parents or legal guardians, as all participants were under 16 years of age.

Competing Interests

The authors declare that they have no competing interests.

Declarations of AI-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used ChatGPT, an OpenAI large language model, to assist with language refinement, including improving grammar, clarity, readability, academic writing style, and formatting certain parts of the manuscript. The AI-assisted technology was not used to generate research data, conduct data analysis, interpret research findings independently, or make decisions regarding the study design, methodology, results, or conclusions. All AI-assisted outputs were carefully reviewed, verified, and substantially revised by the authors, who assume full responsibility for the accuracy, integrity, and originality of the final manuscript.

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Author Contribution

A.S. conceived and designed the study, supervised the research process, and contributed to the development of the pedagogical framework. M. contributed to the research design, methodology, and critical revision of the manuscript. A.F.F. conducted the literature review, analyzed and synthesized the data, drafted the manuscript, and prepared all tables and figures. M.Y.P. contributed to data collection, validation of the learning model, and manuscript review. All authors reviewed, revised, and approved the final version of the manuscript.

Data Availability

All data generated or analysed during this study are included in this published article.

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